than a negative result, and only left it clear to me that the inhalation of oxygen does not protect the system which has been attacked by morphia.

I have once again to repeat my thanks to my assistant, Mr. Landis, for the industry and accurate care with which he aided me in the conduct of this research.

ART. II.—*Amputation at the Knee-joint by Modified Lateral Flaps.*

By STEPHEN SMITH, M.D., Surgeon to Bellevue Hospital, New York. (With three wood-cuts.)

AMPUTATION at the knee-joint may now be regarded as an established operation in surgery. The dangers which have hitherto surrounded it have all been dissipated by the well-directed labours of Markoe, of New York, and of Brinton, of Philadelphia. The recent elaborate papers of these surgeons prove that in every essential particular in which amputation at any point of the leg is justifiable, it is equally justifiable at the knee-joint. The advantages of any given amputation are determined by its safety to life, and the serviceableness of the stump. The statistics embodied in the papers referred to establish the fact that amputations at the knee-joint are as safe as amputations through the thigh. They also prove what is more important, viz., that amputations at the knee are less fatal than similar operations in the upper third of the leg.

There remains still the important question, What method of operation is preferable? Various and very diverse opinions are entertained by surgeons on this subject. The methods recommended and now practised are the long anterior and short posterior flaps, the lateral flaps, the circular, the long posterior flap with section of the condyles (*Syme*), and the long anterior flap with section of the condyles (*Carden*).

The opinions expressed by Markoe and Brinton, the latest writers on the subject of amputation at the knee-joint, and surgeons of large experience, are deserving of especial attention. Markoe says (*N. Y. Med. Journ.*, March, 1868, p. 515):—

> "The mode of operative procedure is so frequently determined by the condition of the parts after the injury that, I doubt not, most surgeons will arrive at the same conclusions that have gradually forced themselves upon us, viz., that it is really of comparatively little consequence what particular method of cutting the flaps be adopted, provided only that enough integument be left amply and easily to cover the expanded extremity of the femur."

He has been inclined to give preference to a long anterior and short posterior flap, because a thicker and tougher covering is thereby secured to the condyles, the drainage is such as to prevent collections of pus, the ligatures are brought out more directly, and the cicatrix is placed behind the swell of the condyles.

Brinton expresses nearly the same opinion and preference. He says (*Am. Journ. Med. Sci.*, April, 1868, p. 336):—

> "The main indication in the disarticulation of the knee is to obtain a sufficient amount of integumental covering to admit of the lips of the wound being brought together without strain. Whether this be accomplished by the circular or oval method, or by the formation of lateral or of antero-posterior flaps, matters but little. The writer's experience inclines him to give the preference to the latter procedure."

Something more, we believe, is now required in this as well as in all other amputations of the lower extremity than the easy adjustment of the flaps at the time of the operation. In the first place, we cannot overlook the proper drainage of the stump during the process of healing. This can be effectually secured, and quite as effectually prevented, by the method of making the flaps. In the second place, it must be remembered that this stump is to receive direct pressure, in progression, from the artificial limb, and hence the necessity of carefully securing such flaps and their adjustment as will render the face of the stump firm and resisting. No stump can be regarded as well adapted to take direct support which is traversed by a cicatrix, and the position of the cicatrix will be determined by the method of operation adopted.

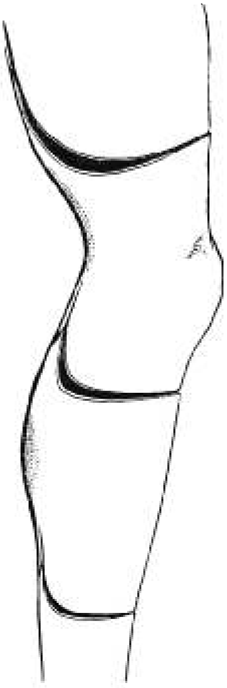
The method of amputation at the knee-joint has, therefore, a much more important bearing upon the immediate success of the operation, and the future usefulness of the limb, than the mere approximation of the flaps without strain. The question recurs, then, What method of forming a covering to the knee-stump will most effectually meet the two conditions above given, viz., thorough drainage, and such cicatrization as relieves the stump from pressure upon a cicatrix?

It may be affirmed of the antero-posterior flaps, as usually made, that they more effectually prevent drainage, and more certainly bring the cicatrix upon important parts of the face of the stump, than any other method of amputation adopted at the knee. When, however, the anterior flap is sufficiently long to allow the posterior flap to be nearly circular, the drainage is direct, and the cicatrix is posterior to the face of the stump. The danger is incurred of sloughing of the anterior flap, which must be made of great length, to cover the extremities of the condyles of the femur. The method by lateral flaps is even better adapted to drainage than that of the long anterior flap, and has the additional advantage of two moderately-sized and well-nourished flaps. But it fails to place the cicatrix beyond the seat of direct pressure on the anterior part of the stump. The circular and oval methods are less adapted to meet the conditions above given than those just described.

The methods of Syme and Carden, involving excision of the condyles, are extremely objectionable, as well as entirely unnecessary, unless there is too little flap.

It is evident from this statement of the results of the different methods of operation that the long anterior flap and the lateral flaps combine the advantages which we seek, both in drainage and the position of the cicatrix, and yet each has certain disadvantages. In several recent amputations at the knee-joint I have endeavoured to combine the good features of the long anterior flap and the lateral flaps, without their objectionable points. The operation is performed as follows: The incision is commenced about one inch below the tubercle of the tibia, and carried downward and forward over the most prominent part of the side of the leg, until it reaches the under surface, when it is curved towards the median line. When that point is reached, it is continued directly upwards to the centre of the articulation. A second incision begins at the same point as the first, and pursues a similar direction upon the opposite side of the leg, and meets it in the median line on the posterior part. The line of incision upon one side is seen in Fig. 1. The following precautions should be remembered, viz., the incisions should incline moderately forwards down to the curve of the side of the leg, to secure ample covering for the condyles, and that upon the internal aspect should have additional fulness for the purpose of insuring sufficient flap for the internal condyle of the femur, which is longer and larger than the external. In the dissection, the skin, fascia, and cellular tissue are raised, and the ligamentum patellæ divided, allowing the patella to remain. The ligatures are all drawn out of the posterior angle of the flaps.

Fig. 1.



The appearance of the flaps immediately after disarticulation is seen in Fig. 2. It will be noticed that the extremity of the femur is already completely covered, and the line of union of the flaps will be between the condyles and over the inter-condyloid notch. When cicatrization is complete, the cicatrix sinks into this notch and disappears from the face of the stump, and offers no point of contact with the artificial appliance. The appearance of the stump on recovery is given in Fig. 3.

In the process of repair, it will be found that the drainage is so perfect that all the anterior portion of the wound remains dry, and frequently heals by immediate union. The dressing of this part of the wound often need not be disturbed more than once or twice until cicatrization is complete.

Fig. 2.

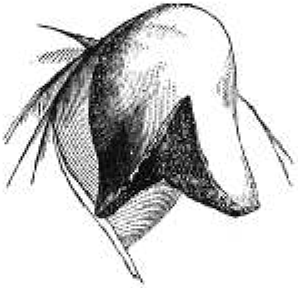
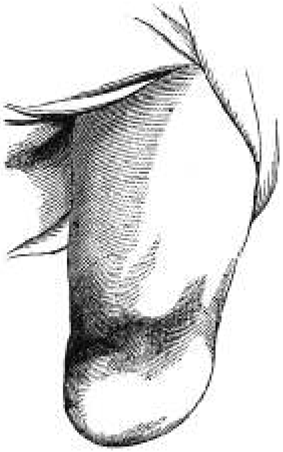


Fig. 3.



This method of amputation need not be limited to the knee. The advantages of drainage, and the removal of the cicatrix from the face of the stump to its posterior part, equally adapt it to amputation in the leg or thigh. I have frequently amputated at both of these points by this method, and obtained the most satisfactory results. The wound heals with remarkable rapidity, and the final perfection of the stump leaves all that can be desired. In Fig. 1 the line of incisions is given in amputation of the leg and thigh by this method. The incision on the posterior part of the leg should extend upwards to the point where the bone is to be sawn through, and there the muscles are divided circularly.

NEW YORK, Oct. 1869.

ART. III.—*A Contribution to the Knowledge of the Physiological Action of the Alkaloids, Viridia, Veratroidia, and Veratria of Commerce, and of the Resin of Veratrum Viride.* By HORATIO C. WOOD, Jr., M.D., Professor of Botany in the University of Pennsylvania. (Read before the Biological and Microscopical Section of the Academy of Natural Sciences, Nov. 1869, and recommended for publication.)

MR. CHARLES BULLOCK, of this city, in the *Proceedings of the American Pharmaceutical Association* for 1867, announced that he had finally completely worked out the chemistry of the *veratrum viride*, and described